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ABSTRACT

This volume is the first of three reporting research that is intended to help postsecondary occupational education deans and directors become able to plan more strategically for using new instructional technologies to meet emerging needs. This document begins with a packet of guidesheets made up of materials from all three volumes. Relevant chapter-page numbers are given in the upper right-hand corner of each sheet. Volume 1 provides an overview of the entire project, "Vocational Education Planning for Economic Development in Texas" (O. W. Markley), which includes a Volume I provides an summary of important factors affecting the future of vocational education in Texas--technological, economic, social, and political factors. Four planning issues of significance for occupational education are treated in detail: emerging instructional technologies; job displacement, especially among women and minorities; public-private initiatives; and planning methods and guidelines for using instructional technologies. Ten exhibits provide checklists and forms useful in implementing the described methodology. Appendixes include information about the Institute for Strategic Innovation and the research team. (YLB)

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PREPARING FOR THE FUTURE OF THE WORKPLACE

VOLUME I: OVERVIEW

Prepared for:

The Texas Higher Education Coordinating Board
Community Colleges and Technical Institutes Division

By:

The Institute for Strategic Innovation

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
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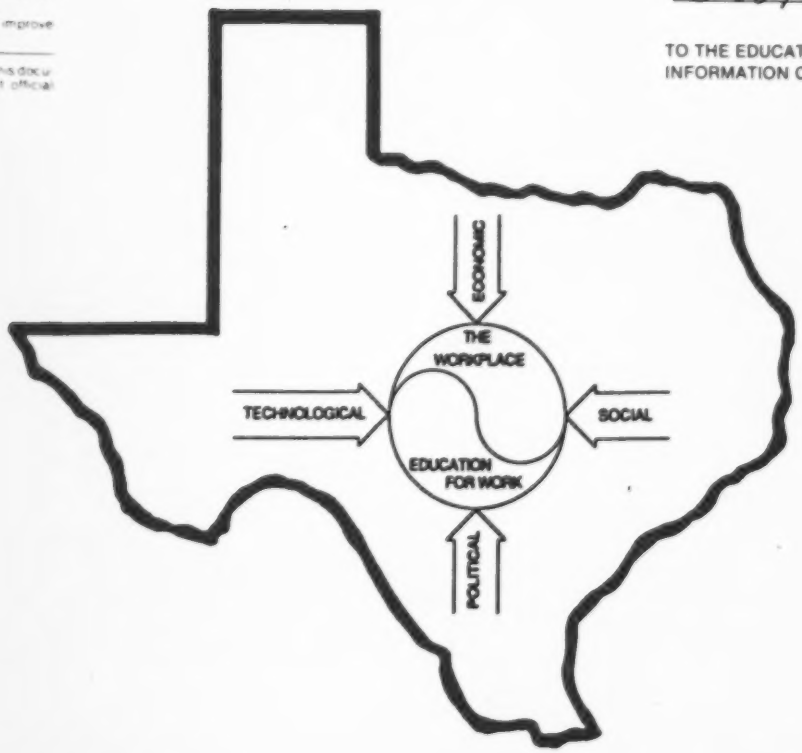

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PREPARING FOR THE FUTURE OF THE WORKPLACE

a project undertaken by the Institute for Strategic Innovation

under subcontract to the North Harris County College

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EXECUTIVE SUMMARY

Much has been accomplished since the Master Plan for Vocational Education in Texas was formally approved by the Higher Education Coordinating Board in October, 1986, and by the Texas Education Agency in January, 1987, and formally became law with the passage of HB 72. The Master Plan thus has a legal mandate to provide strategic planning directions for occupational education,[1] and public education institutions are required by law to comply.

An even broader planning process is now underway by the Texas Strategic Economic Policy Commission, which is scheduled to release a draft of its strategic plan for the State in mid-July, with hearings on the draft report to occur during August and September, and the final report to be approved by the Governor and released before the end of the year. Because the thrust of this Commission, like that of several previous task forces, is to stimulate economic diversification and development, including the improvement of occupational training in needed new skill areas, it also will set major directions which educators will be required to follow.

The research reported here is intended to help deans and directors of community colleges and technical institutes implement planning objectives which comply with the above requirements--especially those set forth in the Master Plan focusing on the development of educational delivery systems based on:

- Emerging needs
- Competitive, cost-effective, state-of-the-art training technologies

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[1] For convenience we use the term "occupational education" to refer also to "vocational and/or technical education."

- Resource funding and implementation via public-private collaboration, rather than by the public sector only.

It follows an earlier working paper entitled, The Future of the Workplace in Texas: A Preliminary Identification of Planning Issues for Technical, Vocational, and Adult Postsecondary Education, which had the same substantive focus, but was aimed at illuminating policy questions asked by the professional staff of the Coordinating Board in connection with Master Plan implementation.

To make it easier for you to read and use this report, we have: 1) written much of it in the active voice; 2) divided it into three volumes, each of which has the same front matter so that you may either bind them together or separately; and 3) drawn together a selected "Packet of Guidesheets" made up of materials from all three volumes. It is appended to the Executive Summary of Volume I, beginning on page vi.

Many of you may find Vol. III the most useful, because it leads off with a practical set of planning methods and guidelines for utilizing emerging instructional technologies. It then presents more advanced materials: 1) a method for developing the "intelligence" needed for effective management of change in public-private settings; and 2) a forecast of technological, economic, social and political "factors" you can read to better understand the complex variety of trends and issues that are likely to impact occupational education in the future. Finally, in the last chapter, we present the results of a needs assessment conducted to ensure that our materials would meet the expressed needs of deans and directors.

Vol. II contains the findings from three background studies:

- A description and forecast of emerging information technologies, especially those with significance for vocational education;

- An analysis of technology-induced job displacement, especially as it affects women and minorities;
- An analysis of public-private collaboration, especially as it could be used for new initiatives which link economic development and vocational education planning.

Vol. I provides an overview of the entire project, including a summary of important factors and planning issues that you may find useful to consider. It ends with a description of how we followed the methodology we describe in this report as we did the research, and includes some surprises we found as we did so. They provided us with insights we think may be useful for you as well. Appended to Vol. I is information about the Institute for Strategic Innovation, the research team, and acknowledgements.

Together, these three volumes are intended to help you strengthen the institutional capacity of the community college and technical institute system in Texas to engage in education planning for economic development.

The main sections of the three volumes are:

Volume I: Overview

Executive Summary

Packet of Guidesheets

Chapter 1. Vocational Education Planning for Economic Development in Texas, by O. W. Markley

Appendix: Acknowledgments, Project Personnel, and Institutional Description

Volume II: Analytical Studies

Executive Summary

Chapter 2. Emerging Information Technologies of Significance for Postsecondary Occupational Education, by Chris J. Dede

Chapter 3. Technology-Related Occupational Displacement and Training Needs, Especially Among Women and Minorities, by Karla M. Back and O. W. Markley

Chapter 4. Public-Private Initiatives as a Strategy for Promoting Effective Implementation, by Paul C. Fama, Karla M. Back and O. W. Markley

Volume III: Planning Materials for Educators

Executive Summary

Chapter 5. Planning to Use Emerging Instructional Technologies: Some Useful Methods and Guidelines, by O. W. Markley, Chris J. Dede, and Karla M. Back

Chapter 6. Intelligence Information for Future-Responsive Planning and Management, by Chris J. Dede and O. W. Markley

Chapter 7. A Needs-Assessment Survey of Deans and Directors in Texas, by Karla M. Back and O. W. Markley

APPENDIX TO EXECUTIVE SUMMARY:

A PACKET OF GUIDESHEETS

FOR PLANNING AND UTILIZATION

OF EMERGING TECHNOLOGIES AND TECHNIQUES

IN EDUCATION

NOTE: Most of the exhibits contained herein are introduced in Chapter 1 and described in more detail in subsequent chapters, where source attribution is given. The relevant (chapter-page) numbers are given in the upper right hand corner of each guidesheet.

ESSENTIAL INTELLIGENCE QUESTIONS FOR STRATEGIC MANAGEMENT

1. What is the likely future of "X"?
2. What is the preferred/feared future of "X"?
3. What factors in the past have controlled or strongly influenced what happens to "X"?
4. Who are the people and/or institutions whose behaviors will most strongly influence the future of "X" ("influentials")?
5. Who has a strong stake in the outcome of "X" ("stakeholders")?
6. What trends, issues, policies, etc. may be emerging that would impact on "X", or our ability to influence it ("cross impacts")?
7. Who is most knowledgeable about the above questions ("knowledgeables")?

For present purposes, "X" may be taken to mean occupational-education delivery systems based on:

- emerging employment needs;
- competitive, cost-effective, state-of-the-art training technologies; and
- resource funding and implementation via public-private collaboration, rather than by the public sector only.

EMPLOYMENT BY MAJOR OCCUPATION: 1900 - 1995

Occupation Group	1900	1930	1960	1980	1995
Professional and technical	4	7	11	16	17
Managerial	6	7	11	11	10
Clerical	3	9	15	19	19
Sales	5	6	6	6	7
Craft	11	13	13	13	12
Operative	13	16	18	14	12
Laborer	12	11	6	5	5
Service	9	10	12	13	16
Farm	37	21	8	3	2

A CHECKLIST OF "BACK OF THE ENVELOPE" PLANNING QUESTIONS

1. **Vision**. What are my (my group's) predominant ⟨ . hopes / . fears / . expectations ⟩ regarding the future of "X"?

2. **Direction**. What do I (we) particularly want to ⟨ . protect / . maintain / . achieve / . change / . create ⟩ in the ⟨ . short / . medium / . long ⟩ range?

3. **SWOT**. What are the main ⟨ . strengths / . weaknesses / . opportunities / . threats / . other factors ⟩ that need to be considered? In particular, what obstacles would prevent success if not overcome or otherwise addressed?

4. **Networking and Huddling**. How, and with whom, do I want to plan for action? What are their considerations about "X?"

5. **Technology**. What methods, tools, or strategies look promising? How rigorously might we want to use each?

6. **Commitment**. How much time and effort am I (and others I can count on) willing to dedicate to this, and for how long? What other resources are likely to be available if needed?

7. **Payoff**. Assuming that adequate time and effort is expended to implement the plans, within likely resource constraints what outcomes can realistically be expected, and when?

8. **Go/No Go.** Given whatever answers you have to the above questions, is the venture really worth doing? If so, who should do what? When? What are the first steps? If not, is there anything else that makes sense to do?

MAJOR PHASES IN INSTRUCTIONAL "TECH" UTILIZATION: A CHECKLIST

Major Phases in Instructional "Tech" Utilization

1. Conduct needs assessment and select objectives for instruction.

2. Set up team to identify and evaluate potential applicable technologies and techniques ("techs") for instructional delivery.

3. Determine which "techs" best meet selected needs.

4. Select software with appropriate capabilities.

5. Evaluate hardware alternatives for identified software (not hardware first and software second.

Checklist

For Phases 1-5

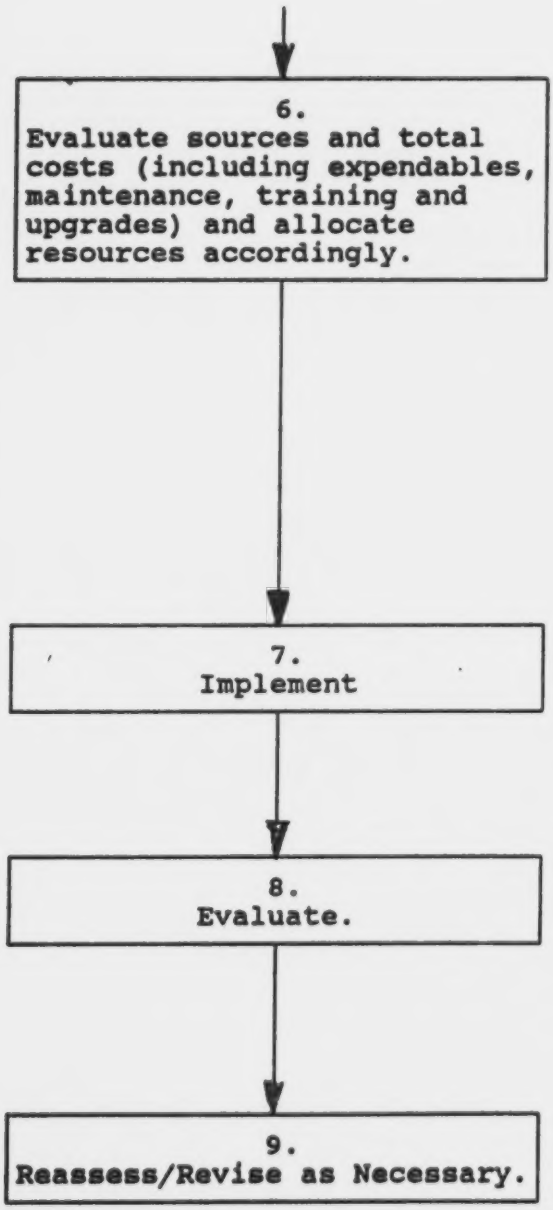
____ Include both representative cross-section of typical users and skeptics in team.

____ Assess carefully being a pioneer: (price-premium, reliability, utility, leadership issues).

____ Choose general-purpose products that will never be obsolete

____ Beware of "vaporware."

____ Be careful in buying "compatible" products (software problems, upgrades, long-term repairability).



For Phase 6

____ Think carefully before undertaking major software development projects (delays, cost, reliability, maintainability).

____ Weigh whether to buy locally or mail-order.

____ Don't put all your eggs in one basket (product, vendor).

____ In-house maintenance is cheaper.

For Phase 7-9

____ Think big when innovating (critical mass of users; multiple, alternative implementation strategies)

____ Promote flexibility in institutional plans, policies, practices, and culture (reward system altered to encourage innovation; freedom to fail).

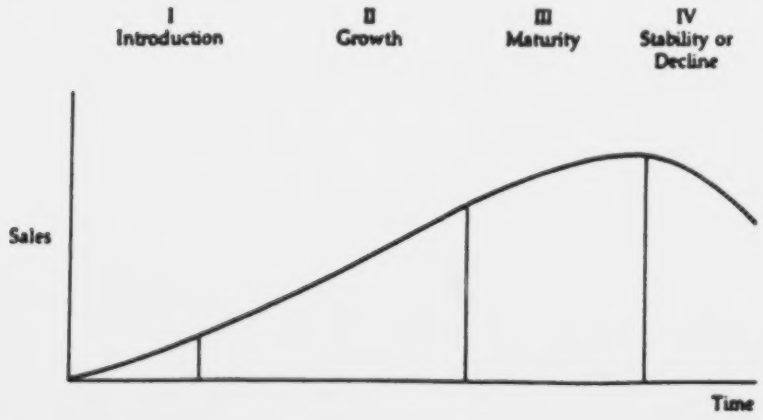
____ Prepare for a new special interest group that "never has enough."

____ Take an appropriate (non-minimal) level of risks.

(1-23; 3-22; 4-11; 5-2)

THE TECHNOLOGY LIFE-CYCLE CONCEPT APPLIED TO SKILL-TRAINING

The Product Life Cycle



Characteristic	Phase			
	I	II	III	IV
Product	Variable; often custom designs	Increasing standardization		Mostly undifferentiated; standardized
Product innovation	Frequent experimentation; major changes	Declining rate		Minor refinements, if any
Volume	Small-scale	Rising volume	Large scale	Large scale
Process	Job-shop; batch production	Increasingly automated	Capital-intensive mass production	Capital-intensive mass production
Process innovation	Exploratory	Relatively high rate; major innovations	Rate declines	Minor refinements, if any
Equipment	General purpose	Increasingly specialized		Special purpose

The Skill-Training Life Cycle

	Phase			
	I Introduction	II Growth	III Maturity	IV Stability or Decline
Tasks	Complex	Increasingly routinized		Segmented
Job skills	Firm-specific	Increasingly general		General
Skill training provider	Employer or equipment manufacturer	Market-sensitive schools and colleges	Schools and colleges more generally	Schools and colleges; some skills provided by employers
Impact on job structures	Job enlargement; new positions	Emergence of new occupations		Rigid job hierarchy with formal education and occupational work experience requirements

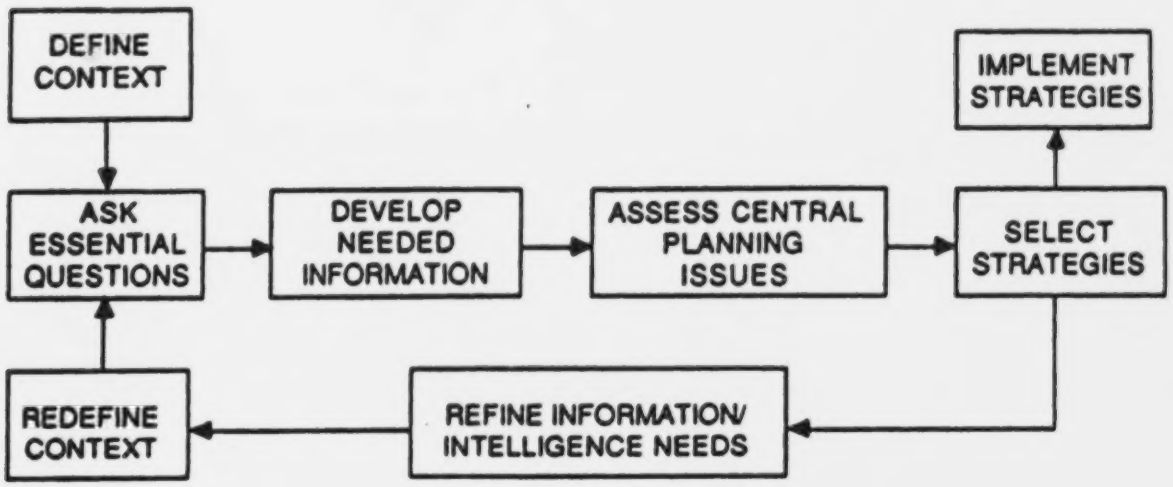
AN APPROXIMATE TIMETABLE OF EMERGING TECHNOLOGIES FOR INSTRUCTION

Functionality	Uses	Time Frame
Cognitive audit trails	Support for finding patterns of suboptimal performance	Late 1980's
High-quality voice synthesis	Auditory natural-language output	Late 1980's
Hypermedia	Interlinking of diverse subject matter; easier conceptual exploration, training, collaboration	Late 1980's
Advanced manipulatory input devices	Mimetic learning which builds on real-world experience	Early 1990's
High-bandwidth fiber-optic networks	Massive real-time data exchange	Early 1990's
Synthesis of computers, telecommunications	Easy interconnection; realistic simulation	Early 1990's
Computer-supported cooperative work (collaborative design, collective problem solving, group-decision support), including WYSIWIS	Mastery of team task performance	Mid 1990's
Intelligent semi-autonomous agents	Support for user-defined independent actions	Mid 1990's
Optical-disk systems with multiple read/write and mixed media capabilities	Support of large data and knowledge bases; very cheap secondary storage; facilitation of artificial realities	Mid 1990's

Sophisticated User Interface Management Systems	Easier development of instructional applications; reduced time for novices to master a program	Mid 1990's
Standardization of computer and telecommunications protocols	Easy connectivity, compatibility; lower costs	Mid 1990's
Consciousness sensors	Monitoring of mood, state of mind	Late 1990's
Current mainframe performance levels on microcomputers	Sufficient power for advanced functionalities	Late 1990's
High-resolution color monitors; real-time animation of 3-D graphics	Easy reading of text; vivid simulation of reality	Late 1990's
Information utilities	Access to integrated sources of data and tools for assimilation	Late 1990's
Knowledge processing and Knowledge Base Management Systems	Goal-oriented, context-specific mastery of concepts and skills	Late 1990's
Microworlds	Experience in applying theoretical information in practical situations	Late 1990's
User-specific, limited-vocabulary voice recognition	Restricted natural-language input	Late 1990's
Artificial Realities	Intensely motivating simulation and experience	Year 2000+
Intelligent tutors and coaches for restricted domains	Models of embedded expertise for greater individualization	Year 2000+

(1-5; 1-30; 6-3)

AN OVERVIEW OF THE STRATEGIC INTELLIGENCE CYCLE



A SUMMARY FORECAST OF INFORMATION TECHNOLOGIES HAVING SIGNIFICANCE FOR INSTRUCTION

Highly Probable/Almost Certain

- High quality voice synthesis
- Advanced manipulatory input devices
- Cognitive audit trails
- Hypermedia
- Synthesis of computers, telecommunications

Reasonably Probable

- High bandwidth fiber optic networks
- Standardization of computer and telecommunications protocols
- Optical disc systems with multiple read/write and mixed media capabilities
- Sophisticated User Interface Management Systems
- Complex simulations
- Computer-supported cooperative work

Conceivable/Uncertain

- High resolution color monitors with 3-D real-time animated graphics
- User specific, limited vocabulary voice recognition
- Microworlds
- Intelligent tutors and coaches for practice sessions on skills already taught
- Consciousness sensors
- Intelligent semi-autonomous agents
- Knowledge processing
- Current mainframe performance levels on microcomputers
- Information utilities

Unlikely

- Multiple speaker, natural language voice recognition
- Intelligent tutors and coaches for stand-alone instruction in restricted domains
- Artificial realities

Again, this forecast depends on economic, political, and ideological factors as well as technological capabilities.

The Strategic Intelligence Cycle

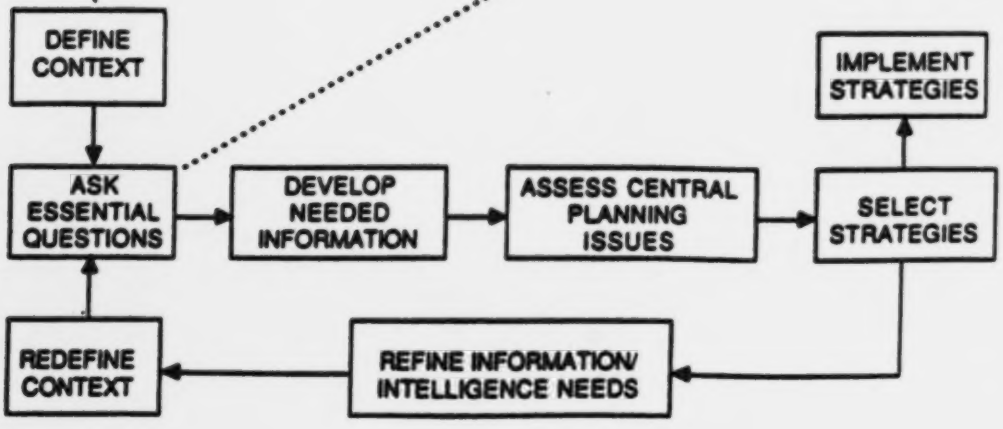
Phase 1: Get Underway

A. Define Context of Inquiry
(to ensure clarity and alignment of key purposes and results):

1. What are the nature and needs of the target audience and outcomes that are desired ?
2. What are the resources and constraints that will shape what is feasible to attempt ?
3. What are the criteria through which to judge effectiveness ?

B. Explore Essential Questions
(to identify and understand key planning issues):

1. What is the likely future of "X" ?
2. What is the preferred/feared future of "X" ?
3. What factors have previously controlled or strongly influenced what happens to "X" ?
4. Who are the people and institutions whose behaviors will most strongly influence "X" ? ("influentials")
5. Who has a strong stake in the outcome of "X" ? ("stakeholders")
6. What trends, issues, policies or other forces may be emerging that may strongly impact on "X" or our ability to influence "X" ? ("cross impacts")
7. Who is the most knowledgeable about the above questions ? ("knowledgeables")



The Strategic Intelligence Cycle

Phase 2: Develop a Change Oriented Information Framework

(to organize and manage needed information)

a. Historical Context of "X"

- Past writings of importance
- Legislative and/or judicial history
- Other historical factors of importance (e.g., key vested interests)

b. Key Actors and Agenda

- Influentials
- Stakeholders
- Knowledgeables

c. Key types of Information

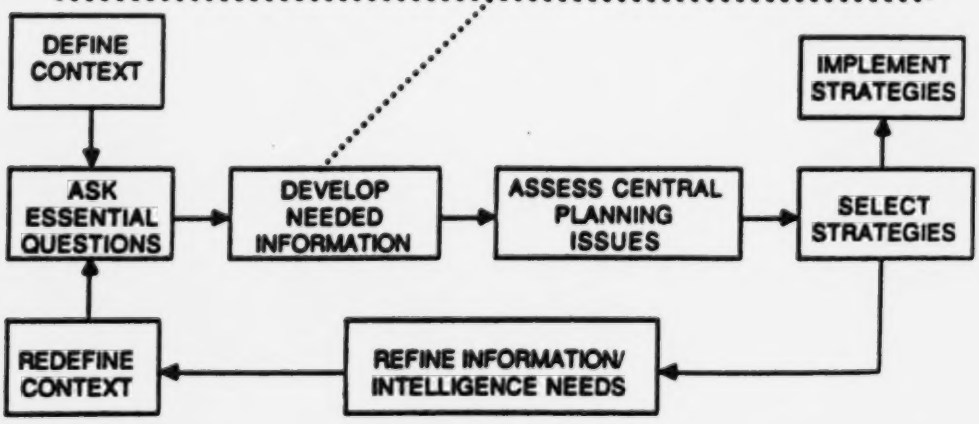
- Documents
- Contacts
- Messages

d. Alternative Approaches

- Ideologies
- Schools of thought
- Policy proposals
- Possible coalitions

e. Things to Monitor

- Media coverage
- Movement in key policy proposals
- Changes in "story" of key actors
- Changes in other key factors



The Strategic Intelligence Cycle

PHASE 3. Assess Central Planning Issues
(to develop appropriate strategies)

a. Identify critical factors, obstacles and incentives

What factors must be influenced if the future of "X" is to become what we want it to be ?

What obstacles are likely to prevent us from influencing things as we would like ?

What incentives can be brought to bear to overcome obstacles ?

b. Estimate critical timing relationships

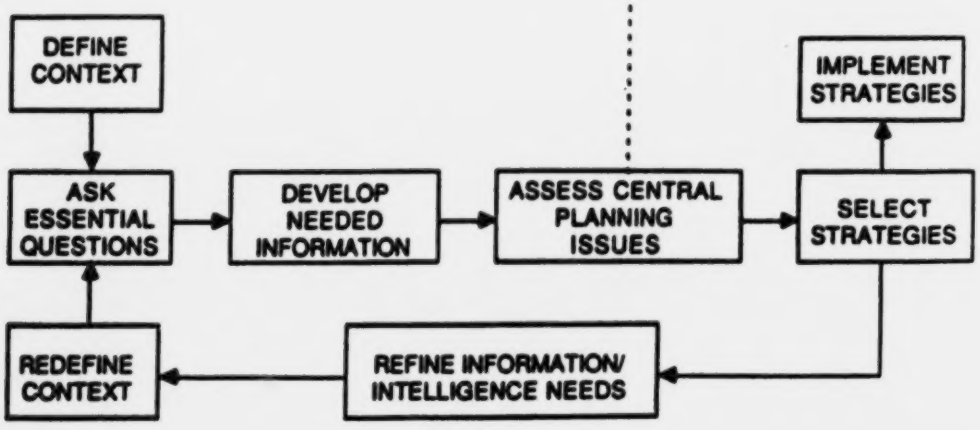
Are any key factors likely to become "acute" and require a crisis-reaction strategy that would be less effective or more costly than a proactive response ?

What is the likely sequence and timing of events that will most strongly influence "X" assuming that we do not intervene "proactively" ?

c. Identify Probable and Desirable Roles

Who are the relevant players ?

What is the range of roles that each is likely to play, assuming either that we do, or that we do not act proactively ?



The Strategic Intelligence Cycle

Phase 4. Select Strategies
(to successfully influence the future of "X")

- Take direct action
- Engage in single-issue lobbying
- Collaborate with coalition networks to develop a broad range of proactive agenda
- Publicize selected issues or points of view
- Develop needed information to answer critical questions

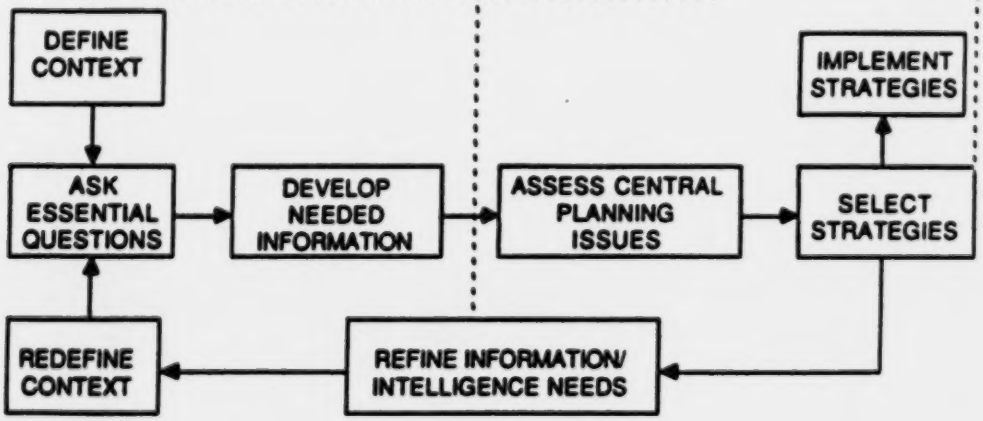
Phase 5. Refine Information/ Intelligence Needs

a. Type of Information

- Statistical data
- Authoritative reports
- Knowledgeable experts

b. Immediacy of Source

- Primary sources (personal communication or original writing)
- Secondary Sources (popular literature, news media, trade/professional working papers, etc.
- Tertiary sources (summaries, abstracts, indexes, etc.)



A FRAMEWORK FOR CHOOSING A PLANNING METHOD

Type of District	Short Range (1 - 2 years)	Medium Range (2 - 5 years)	Long Range (5 - 10 years)
Small and resource-limited, but with high awareness and commitment	Planning Method 1	Planning Method 1, informed by Method 2	Planning Method 2 or 3
Medium-to-large, resource-wealthy, plus high awareness and commitment	Planning Method 2	Planning Method 2 or 3	Planning Method 3
Large or small, regardless of resources, with low-to-medium awareness and commitment	Planning Method 1	Planning Method 1	Planning Method 1

Note: The three planning methods, which are described in the text, are:

Method 1: "Advanced Back of the Envelope Planning"

Method 2: "Entry Level Strategic Planning"

Method 3: "More Advanced Techniques for Strategic Planning and Management"

CHAPTER 1

OCCUPATIONAL EDUCATION PLANNING FOR ECONOMIC DEVELOPMENT IN TEXAS: AN OVERVIEW

By:

O. W. Markley

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CHAPTER 1

OCCUPATIONAL EDUCATION PLANNING FOR ECONOMIC DEVELOPMENT IN TEXAS: AN OVERVIEW

The Future of the Workplace and Education for Work in Texas

A Scenario of Accomplishment

The year is 1994. Economic development in Texas is on the upswing, in spite of nationwide austerity policies designed to control the Federal debt. Although oil prices are again on the rise, they continue to follow the sort of large-scale swings that used to wreck havoc on the Texas economy. But the State is not as dependent on energy-related employment now, due to economic diversification and new types of employment and training. Unemployment is declining.

Community colleges and technical institutes are forging new alliances with business/industry and with the 4-year university systems in the state to upgrade relevance of skills, both in the community and in academia. In addition to the variety of public-private initiatives that have been developed to quicken the development and transfer of technology, both as a source of employment and as a way to improve training, the State has sponsored development of consortia for regional occupational forecasting and projection of emerging training needs involving the State Occupational Information Coordinating Council, several university-based centers, and a number of regional councils for occupational-education planning and development to represent all sectors of society. Development of a state-wide satellite-based instructional TV cooperative is well underway, and uses of new hypertext-based instructional technologies are under consideration. It is an exciting time to be involved in vocational, technical, and adult education.

A Scenario of Stagnation

The year is 1994. The Texas economy continues to be rocked by fluctuations in oil prices, now made more severe by the

austerity policies emanating from Washington and Austin to balance the budget. Conditions of protectionism prevail, both nationally and regionally, while unemployment is increasing.

In spite of scattered efforts by entrepreneurially oriented leaders in academia, business/industry, and government to forge new public-private initiatives and other forward-looking policies that would stimulate economic diversification and job retraining throughout the State, disinterest and active resistance have combined to prevent such innovations from becoming systemically effective throughout the State.

The Most Likely Future: A Developing Vision

Until recently in Texas, and to a large extent even now, the driving forces influencing employment patterns and occupational-education offerings were agriculture and resource extraction--principally oil. Market fluctuations during the past 15 years, though, have made it clear that the state cannot continue to rely on these industries exclusively for its economic well-being. As the recent report of the Texas Science and Technology Council (1987, p. 6) points out:

> The Texas economy has never faced a greater challenge. The State is paying a heavy price for overreliance on its energy and agricultural industries and for the vulnerability of its manufacturing industry to foreign competition. A consensus has emerged concerning the need for new strategies to guide the new Texas economy but public policies essential for building the new Texas economy have lacked a central focus...Business as usual is no longer possible, or even desirable. If Texas' leaders ignore the State's basic problems and do not act in a concerted way to solve them, the result will be a continuation of the current economic decline. It is up to Texans to choose which future they want to pursue. The current economic slump presents an opportunity for the state's leaders in government, the

> professions, academia and business/industry to address long-term problems and sponsor lasting economic revitalization...To get the job done, public policy and private sector initiatives must be targeted at eliminating weaknesses in human resources development, basic and applied research, innovative processes and technology transfer.

Recommendations made in the Council's report, Strategies for a New Texas Economy, together with Recommendations of the Business Development and Jobs Creation Task Force, and Critical Economic Development Legislative Issues and Public/Private Sector Initiatives (Business Development and Jobs Creation Task Force, 1987a; 1987b), typify the ferment that is stimulating the thinking among business, educational, and government leaders in Texas today, and the visions for Texas they are producing.

Anticipating this growing concern, the Texas Higher Education Coordinating Board emphasized the pivotal role that postsecondary and adult education can play in economic development, competitiveness, and stability throughout the State in its long-range Master Plan for Vocational, Technical and Adult Education, which it formally approved in October, 1986. The Texas State Board of Education also formally approved of this blue print for restructuring occupational education and training in Texas, when it approved its part of the Master Plan in January, 1987. A number of future-oriented initiatives have been undertaken in support of the objectives of the Master Plan. A noteworthy example is the recent grants competition conducted jointly by the Texas Education Agency, the Texas Higher Education Coordinating Board and the Texas Department of Community Affairs for "Implementing Regional Planning for Occupational Education and Training to Support Economic Development Initiatives in Texas." Regional public-private initiatives in El Paso, North East Texas, and San Antonio were funded for renewable one-year projects. (A regional-planning project meeting the same design

criteria, but without similar funding and external evaluation, is being undertaken in Dallas as well.)

As is pointed out in Chapter 2, new initiatives to implement emerging technologies and techniques (which we will, for convenience, call "techs") often impact on institutions in four stages:

Stage 1. An institution adopts new techs to more effectively carry out existing functions.

Stage 2. The institution changes internally (work roles, organizational structure) to take better advantage of these new efficiencies).

Stage 3. The institution develops new functions and activities enabled by additional capabilities of the techs.

Stage 4. The original role of the institution may be radically transformed as new goals direct its activities.

Intelligence Information for Strategic Occupational Education Planning--The Thrust of this Research

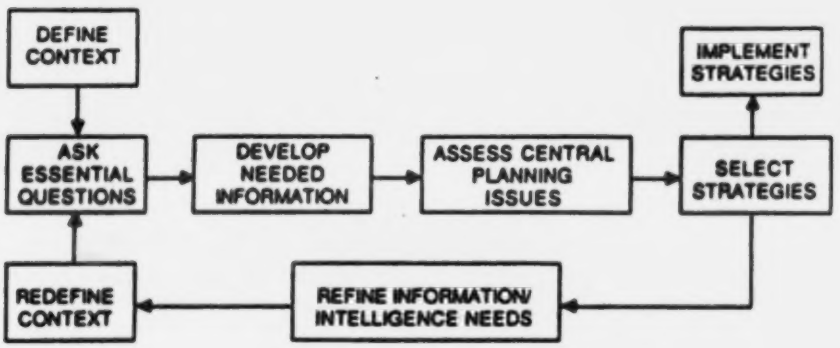
The word "strategy" comes from the Greek word *strategos*, meaning, "that which a general does before entering battle." It is frequently used (and sometimes misused) by business corporations, who find it increasingly difficult to maintain **sustainable** profitability due to rapidly changing economic conditions, turbulence, and uncertainty. Strategic planning and management concepts are being adopted as well by nonprofit institutions, and for use in hybrid public-private initiatives.

Simply stated, the objective of this research is **to help postsecondary (PSI) occupational deans and directors become able to plan more strategically for using new instructional technologies to meet emerging needs**. An overview of the methodology we used is provided by the "strategic intelligence" model shown on the next page in Exhibit 1.1. We used it in the research reported here as well as in that reported in an earlier working paper, *The Future of the Workplace in Texas: A*

Preliminary Identification of Planning Issues for Technical, Vocational, and Adult Education (Back, et al., 1987). We will discuss our experience with it and with other "techs" we used in this research in the final section of this chapter.

EXHIBIT 1.1

AN OVERVIEW OF THE STRATEGIC INTELLIGENCE CYCLE



Rather than assume that the Strategic Intelligence Cycle would necessarily be an attractive tool for use by postsecondary-level educational leaders, however, we undertook a needs-assessment survey of all PSI occupational[1] deans and directors in Texas. (The instrument itself and their responses are described in Chapter 7.) Essentially, most indicated that specific guidelines are more useful than conceptual models. Also, while only minimal "high tech" awareness and skills currently exist in many PSIs, there is high interest regarding new instructional technologies that might be used in occupational education. We therefore have prepared an entirely new set of planning

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[1] For convenience, we herein use the term "occupational education" to include vocational and/or technical training and/or education, although we are aware of the several important distinctions are often made among them.

guidelines, based on the model shown above, but adapted to the practical needs of deans and directors. They are introduced later in this chapter.

We next consider a variety of factors you may wish to consider as you think about your responsibilities. They are essential to the practice of good strategic planning.

Factors Affecting the Future of Occupational Education in Texas

The seven questions shown below in Exhibit 1.2 get right to the heart of what you need to know for planning that is responsive to the changing conditions that matter most, whatever the topic. As you can see, I used this list to help structure the sequence of ideas covered in this chapter.

EXHIBIT 1.2

ESSENTIAL INTELLIGENCE QUESTIONS FOR STRATEGIC MANAGEMENT

1. What is the likely future of "X"?
2. What is the preferred/feared future of "X"?
3. What factors in the past have controlled or strongly influenced what happens to "X"?
4. Who are the people and/or institutions whose behaviors will most strongly influence the future of "X" ("influentials")?
5. Who has a strong stake in the outcome of "X" ("stakeholders")?
6. What trends, issues, policies, etc. may be emerging that would impact on "X", or our ability to influence it ("cross impacts")?
7. Who is most knowledgeable about the above questions ("knowledgeables")?

For present purposes, "X" may be taken to mean occupational-education delivery systems based on:

- emerging employment needs;
- competitive, cost-effective, state-of-the-art training technologies; and
- resource funding and implementation via public-private collaboration, rather than by the public sector only.

So...what about "the future of X"?

Although there may be some disagreement regarding the types of future that are most desired and feared, we assume that the three scenarios presented at the beginning of this chapter are reasonably accurate depictions of the range of hopes, fears, and expectations currently held by influential leaders in the State of Texas.

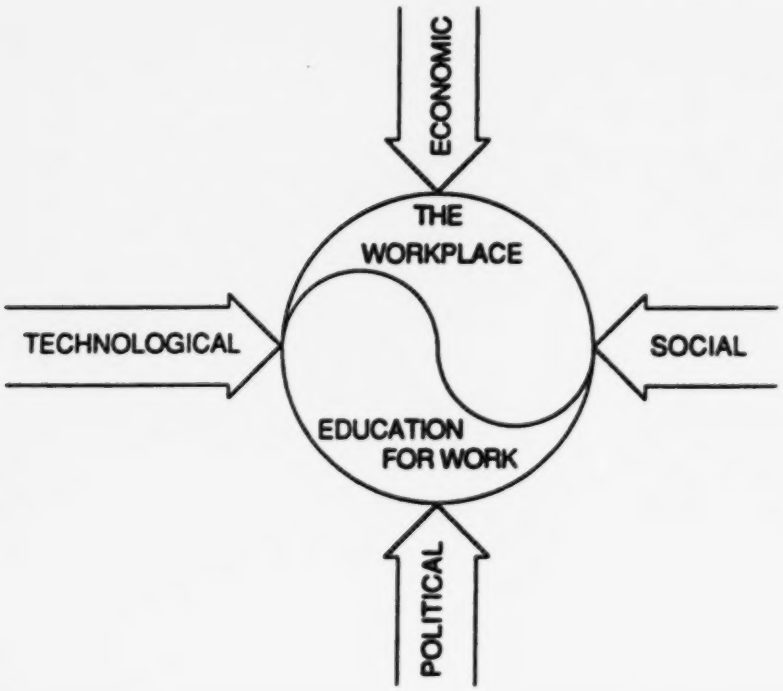
Economic needs have strongly shaped occupational-education program and delivery systems in the past. Moreover, given the vitality of the new vision, and the increasingly strong consensus which appears to be growing among influential leaders on behalf of it, we assume that this will continue to be the case. Thus, an optimistic view of the "likely future of X," may be closer to the mark than a pessimistic one.

Nevertheless, we do not find it feasible to predict the actual occurrence of the future characterized above as "most likely:" 1) because it critically depends on whether the strategic planning objectives leading to it are implemented successfully; 2) because their credibility is not as yet well established among various regional leaders responsible for implementation; 3) because these agenda have not been highly publicized statewide--and therefore have not reached the employers, students, and other likely beneficiaries, who are important stakeholders in this matter; and 4) because much technical work remains to be done before implementation is fully feasible (the operational capability to forecast regional occupational demand in the four planning projects noted above and in others like them is a case in point).

Exhibit 1.3 displays four categories of cross-impacting factors that strategic planners often use when preparing an "environmental analysis"--these being technological, economic, social, and political in nature. They are summarized below, with more detailed information on trends and issues in each of the four categories presented in the Chapter 6.

EXHIBIT 1.3

ENVIRONMENTAL FACTORS OF IMPORTANCE



Technological Influences

For purposes of educational planning, it is useful to distinguish between two main types of technology, even though there is considerable overlap: 1) technologies that require new knowledge and skills to use, and that often become new bases for employment; and 2) technologies that impart knowledge and develop needed skills in new ways, and that often become the basis of new instructional technologies. It is also useful to distinguish between short-range and long-range factors.

New technological bases for employment in the near-to-medium term include:

- The emergence of powerful tools for manipulating information; large-scale information utilities; and nearly "intelligent" technologies for instruction, process control, etc.
- Advances in biotechnology, with applications in medicine, farming, animal husbandry, energy, chemical feedstocks and materials processing
- The emergence of computer integrated manufacturing (CIM), involving integrated systems for design, development, manufacture, inventory, shipping, billing, etc.
- The evolution of office automation technologies for management, information systems, accounting, planning, budgeting, communications, etc.

In the long term, new technological bases for employment may also include:

- Near room-temperature superconductive materials that should enormously increase the efficiency with which electricity is distributed, both as a basic resource and in a wide range of electrical and electronic applications
- "Nano-technology," (technology that operates in the physical domain of a nanometer--.000000001 meters), envisioned to include the capability both to design and shape the atomic structure of new molecules on an "atom-by-atom" basis, and to perfect molecular level automated assembly processes.

New technological bases for education in the near-to-medium term include:

- "Intelligent" computers, including mainframe, mini and personal units with applications involving all of the technologies listed below
- Laser videodiscs, making possible interactive programming for either instruction (training to use a new type of technology on the job) or reference (trouble-shooting and maintenance of that technology on the job)

- **Authoring system** software, through which instructors or other personnel, who are not themselves programmers, can translate conventional instructional courseware into a high-tech equivalent having greater instructional efficiency and effectiveness

- **Hypermedia** (or multimedia hypertext), which allows the storage and interlinking of information and processes stored in many different types of devices (e.g., text, graphics, video, audio, etc.) for easy searching, access and retrieval

- **Expert system** software, which enables computers to duplicate many reasoning tasks necessary for "intelligent computer-assisted instruction" (ICAI)

- **Interactive instructional television (ITV) systems**, involving use of both satellite and land-line transmission, and selected technologies noted above.

In the long term, new technological bases for education include:

- **Integrative delivery systems**, such as the "teleport" concept envisioned in the Master Plan, through which selected applications of the above technologies could be integrated with a satellite transmission network for instruction at the workplace as well as at public educational institutions.

Economic Influences

Near-to-medium term economic factors influencing the future of the workplace and education for work include:

- **The changing nature of employment**, with a continuing shift from agricultural to industrial to service-oriented jobs, as shown by Exhibit 1.4. Over the next decade, an estimated 75% of new Texas jobs will be in labor-intensive service industries

- **Global economic interconnectedness, price instabilities and economic uncertainty** that combine to make sound economic planning difficult--particularly in the Texas economy, with Texas banks having high loan exposure to energy companies hard hit by oil-price changes, as well as to Mexican and other Third World countries that are heavily in debt

- **The national debt**, now in excess of $400 billion, makes the U.S. the largest debtor nation on Earth; left unchecked, it could reach $1 trillion before the year 2000, making us a larger debtor than all other debtor nations combined

EXHIBIT 1.4
EMPLOYMENT BY MAJOR OCCUPATION: 1900 - 1995

(percentage distribution)

Occupation Group	1900 [a]	1930	1960	1980	1995 [b]
Professional and technical	4	7	11	16	17
Managerial	6	7	11	11	10
Clerical	3	9	15	19	19
Sales	5	6	6	6	7
Craft	11	13	13	13	12
Operative	13	16	18	14	12
Laborer	12	11	6	5	5
Service	9	10	12	13	16
Farm	37	21	8	3	2

[a] Distributions for 1900 and 1930 based on experience civilian labor force. Distributions for other years based on total employed persons.

[b] Data for 1995 based on moderate-trend projections.

Source: Levin, H.M. State Planning for Higher Education and Jobs in an Age of High Technology, 1984; Historical Statistics of the United States, Part 1 (Washington, D.C.: U.S. Government Printing Office, 1975), Tables D182-232; U.S. Department of Labor, Employment and Training Report of the President (Washington, D.C. U.S. Government Printing Office, 1979 and 1982), Table A-16 and A-18; George T. Silvestri, John M. Lukasiewicz, and Marcus E. Einstein, "Occupational Employment Projections Through 1995," Monthly Labor Review 106 (November 1983), Table 1.

- **Negative balance of payments** to other nations for imports in excess of exports, much of that fueled by job exportation or payments for the use of foreign capital--up from $10 billion in 1986 and $17 billion in 1987, to an estimated $27 billion in 1988--possibly $50 billion by 1990

- **Economic austerity policies** designed to reduce the governmental and personal level of spending, although politically unpopular, are not unlikely, and would significantly influence economic development and education in the medium term

- **Increased competitiveness for resources**, especially at state level, between priorities including higher education

- **Increased emphasis on economic diversification and development**, both in Texas and other states, thereby making a highly competitive arena in which different intra - and interstate regions compete for new sources of employment

- **Increased job displacement**, especially among women and minorities

The nature of **state and national strategies for techno-economic competitiveness** will be an economic factor in the longer term. The following three scenarios illustrate the range of strategies now proposed for dealing with this complex question, and possible impacts on occupational education:

1. **A "superindustrial" workplace as America's predominant economic development--where the use of expensive human labor in making high-quality standardized goods is minimized by means of highly automated technologies. Though economic growth might be robust, obsolescence-based unemployment with the growth of low-skill service occupations would be correspondingly high. This scenario would present occupational education with a highly polarized set of needs, and the supply of technical training that educators wish to offer might not reflect actual demand in the workplace.**

2. **Protectionist trade policies as America's predominant economic development strategy--where an attempt is made to retain the current occupational profile as long as possible by suppressing imports of steel, automobiles, and other products in which the U.S. has a substantial historic investment. Forced retraining and obsolescence-based unemployment would be minimized, but so would economic vitality. This scenario would call for a continuation of the status quo in postsecondary vocational, technical and adult education; even so, it would not prevent future decreases in both employment and training.**

3. **A knowledge-based workplace as America's priority economic development strategy--where the emphasis on standardization shifts to the use of new "intelligent person/tool" partnerships, which support the customizing not only of products and services, but the way in which they are generated to meet situational needs. The United States is well positioned to lead and perhaps even dominate this market using its relatively well-educated workforce and entrepreneurial cultural traditions. This scenario would require advanced methods and delivery systems for retraining workers--the goal being "sustainable occupational change," which involves incorporating a balanced mix of specialized and basic-knowledge courses into the typical postsecondary-vocational, technical, or adult-education curriculum.**

Social Influences

Near-to-medium term social factors influencing the future of the workplace and education for work include:

- **Demographics. The increased number of older persons looking for work, coupled with a declining birthrate, will cause a scarcity of young workers having recent, up-to-date, training. This in turn is expected to create an expanding market for mid-life skill retraining.**

- **Immigration**. Especially in the extra-urban regions of Texas, such as Houston, the constant influx of a relatively unskilled population needing job-related training is a problem often aggravated by the general inability of immigrants to communicate well using English. Moreover, few are aware that instruction in English as a second language is available.

- **Increasing ethnic and cultural diversity in the workplace.** The percentage of white youth entering the workforce will decrease as the percentage of minority youth increases. Hispanic, Black and Asian cultures--each differing significantly with regard to workplace life styles and motivations--continue to grow faster than the Anglo culture.

- **Increasing social problems affecting the workforce**. The number of high-school dropouts is expected to increase, with 25% of all ninth graders not graduating. For minorities and the poor, in particular, the rates may be even higher, with increased functional illiteracy a likely result. This will have an enormous effect on job-training programs. Other problems, such as drug abuse, also need to be considered.

- **Social attitudes**. From region to region of the state, attitudes may differ significantly regarding the value of "state of the art" training and employment opportunities. Those workers who are less well-paid and less well-educated often have mixed feelings about the occupational and social influx of high technology.

In the long term, perhaps the major social trend will be the translation of such social concerns into political issues--not from the positive ethical concern of the middle classes, (such as the "war on poverty" that occurred in the late sixties and early seventies) but rather from their fears for safety, security, and well-being.

Political Influences

Here, it is helpful to distinguish two main types of political factors: 1) general trends and issues, which in large part reflect the translation of concern about the technological, economic, and social items noted above into some sort of political agenda; and 2) concerns and initiatives dealing specifically with economic development and occupational education.

General political factors relevant to the future of the workplace and education for work include:

- Rising concerns about drugs, violence and other anti-social behavior, resulting in restrictive practices, such as drug testing, in the workplace.

- Rising concern about issues affecting job displacement--loss of employment due to factors such as job exportation to other nations or the installation of new technologies that eliminate old jobs; unemployment--the inability to get work; and disemployment--working at an unsatisfactory job, which may be better than no employment at all.

- The growing political power of "non-traditional" interest groups, especially non-Anglo ethnic groups and the elderly, which may fairly be expected to hold strong political views in regard to occupational and adult education (e.g., "workfare").

- A rising "social dependency" ratio of retired to working persons, which can be expected to as well motivate concern for job training.

In the long term, it is not inconceivable that these concerns could translate into political agenda involving a marked return to an educational work ethic--especially among black youth, many of whom now see little hope in pursuing education as an avenue to economic betterment.

Regarding specific influences on the political outlook for linking occupational-education planning with emergent economic development needs, a pronounced shift is apparent in the perception of regional leaders in various parts of the State, largely due to the significant increase in state-wide initiatives to this end now underway. The most notable example is the Texas Strategic Economic Policy Commission, whose charge is virtually that of creating a strategic plan for the entire State. Co-chaired by Jim Adams of AT&T and John Cator of M-Bank (who also co-chaired the Business Development and Jobs Creation Task Force cited earlier) and consisting of commissioners representing all sectors of leadership in Texas, the Commission's vision statement

lists four major objectives:

A. Enhance Quality of Work Force

- Intensify the commitment to quality education for all, with special emphasis on meeting the short- and medium-term requirements of a highly skilled workforce, including basic skill development.

B. Assist the Competitiveness of Existing Businesses

- Promote policies that enhance the vitality and competitiveness of traditional sectors of the economy such as agribusiness, energy and manufacturing.
- Formulate policies to expand international trade.
- Build on the great diversity of Texas' economic regions by linking them through cooperation, coordination, and a high quality infrastructure.

C. Encourage New Business Development

- Encourage diversification of the State's business base and develop policies which ensure that entrepreneurism thrives.
- Support the growth and development of indigenous industry to take advantage of Texas' large internal markets and natural resources.

D. Develop New Technologies

- Mobilize public and university innovation and research to gain technological advantage for existing and emerging industries.

The Commission has structured itself into five task forces, now preparing individual reports due out in mid-June of 1988 on:

- Traditional industries
- Emerging industries
- New business development
- Government/business cooperation
- Climate for economic vitality.

A first draft of the final Commission report is scheduled for mid-July, with public hearings for August and September planned in various parts of the State. Following its reformulation and approval by the full Commission in October or November, the

report is expected to be released in mid-December, 1988, and will certainly play an important role in shaping Texas economic development and occupational education in the years to come. If you wish to ensure that your views are heard before the Commission makes its final recommendations, you should consider giving testimony at one of the Commission's public hearings. For more information, call Bob Farley, Department of Research and Planning, Texas Department of Commerce, 512-320-9657.

Selected Planning Issues of Significance for Occupational Education

We turn now to four selected topics pertinent to occupational education planning and development, each of which is treated in more detail in succeeding chapters:

1) Emerging instructional technologies
2) Technological displacement, in particular of women and minorities
3) Using public-private partnerships to mobilize new initiatives
4) Planning methods and guidelines for utilizing instructional technologies.

Emerging technologies for Instruction

Forecasts of emerging technologies for instruction are treated in different levels of depth in two later chapters. You can find a practical forecast of general factors expected to influence the nature of employment and occupational education in Chapter 6. These were earlier summarized under the headings: technological, economic, social and political. Chapter 3, from which the following two exhibits are taken, presents a more technical explanation and forecast of emerging instructional technologies. The forecasts in Chapter 6 are more useful for general educational planning while those in Chapter 3 are more useful for instructional technology planning.

Exhibit 1.5 lists a variety of emerging instructional technologies according to their estimated probability for becoming functionally significant for occupational education. Exhibit 1.6 lists each functionality, together with its specific use and approximate availability date.

Some, perhaps many, of the terms used on these two exhibits may be unfamiliar to you. This is not unexpected, since these are, after all, new technologies. To help readers new to these concepts "tool up" without undue effort, Chapter 2 is structured in two parts: Part I provides an introductory explanation of each, including the forecasts noted above, and ends with a fictional scenario which gives you a concrete feel for how such technologies might be integrated into an advanced instructional system; Part II then traces the historical evolution of these technologies, doing so with more technical detail than Part I provides. Naturally, because these are <u>emerging</u> technologies, a gap exists between what most community colleges <u>currently</u> use and what this report points to.

EXHIBIT 1.5
A SUMMARY FORECAST OF INFORMATION TECHNOLOGIES HAVING SIGNIFICANCE FOR INSTRUCTION

Highly Probable/Almost Certain

- High quality voice synthesis
- Advanced manipulatory input devices
- Cognitive audit trails
- Hypermedia
- Synthesis of computers, telecommunications

Reasonably Probable

- High bandwidth fiber optic networks
- Standardization of computer and telecommunications protocols
- Optical disc systems with multiple read/write and mixed media capabilities
- Sophisticated User Interface Management Systems
- Complex simulations
- Computer-supported cooperative work

Conceivable/Uncertain

- High resolution color monitors with 3-D real-time animated graphics
- User specific, limited vocabulary voice recognition
- Microworlds
- Intelligent tutors and coaches for practice sessions on skills already taught
- Consciousness sensors
- Intelligent semi-autonomous agents
- Knowledge processing
- Current mainframe performance levels on microcomputers
- Information utilities

Unlikely

- Multiple speaker, natural language voice recognition
- Intelligent tutors and coaches for stand-alone instruction in restricted domains
- Artificial realities

Again, this forecast depends on economic, political, and ideological factors as well as technological capabilities.

EXHIBIT 1.6

AN APPROXIMATE TIMETABLE OF EMERGING TECHNOLOGIES FOR INSTRUCTION

Functionality	Uses	Time Frame
Cognitive audit trails	Support for finding patterns of suboptimal performance	Late 1980's
High-quality voice synthesis	Auditory natural-language output	Late 1980's
Hypermedia	Interlinking of diverse subject matter; easier conceptual exploration, training, collaboration	Late 1980's
Advanced manipulatory input devices	Mimetic learning which builds on real-world experience	Early 1990's
High-bandwidth fiber-optic networks	Massive real-time data exchange	Early 1990's
Synthesis of computers, telecommunications	Easy interconnection; realistic simulation	Early 1990's
Computer-supported cooperative work (collaborative design, collective problem solving, group-decision support), including WYSIWIS	Mastery of team task performance	Mid 1990's
Intelligent semi-autonomous agents	Support for user-defined independent actions	Mid 1990's
Optical-disk systems with multiple read/write and mixed media capabilities	Support of large data and knowledge bases; very cheap secondary storage; facilitation of artificial realities	Mid 1990's

EXHIBIT 1.6 CONCLUDED

Sophisticated User Interface Management Systems	Easier development of instructional applications; reduced time for novices to master a program	Mid 1990's
Standardization of computer and telecommunications protocols	Easy connectivity, compatibility; lower costs	Mid 1990's
Consciousness sensors	Monitoring of mood, state of mind	Late 1990's
Current mainframe performance levels on microcomputers	Sufficient power for advanced functionalities	Late 1990's
High-resolution color monitors; real-time animation of 3-D graphics	Easy reading of text; vivid simulation of reality	Late 1990's
Information utilities	Access to integrated sources of data and tools for assimilation	Late 1990's
Knowledge processing and Knowledge Base Management Systems	Goal-oriented, context-specific mastery of concepts and skills	Late 1990's
Microworlds	Experience in applying theoretical information in practical situations	Late 1990's
User-specific, limited-vocabulary voice recognition	Restricted natural-language input	Late 1990's
Artificial Realities	Intensely motivating simulation and experience	Year 2000+
Intelligent tutors and coaches for restricted domains	Models of embedded expertise for greater individualization	Year 2000+

Job displacement, especially among women and minorities

A key question regarding the above technologies is whether they will be used more for "user-friendly" standardization (which tends to maximize "de-skilling" and job displacement--as portrayed in the first of the above scenarios), or "user-directed" customized applications (which tend to require more re-skilling and job creation--as portrayed in the third scenario). Either way, it is increasingly well known that the introduction of new technologies often results in significant displacement of workers from existing employment. This can be due to technological factors, where the need for a particular job is eliminated; or to economic factors, where an entire industry is exported to a region of the world where labor costs less.

Though not widely known, job displacement disproportionately affects women and minorities, many of whom are single parents. Chapter 3 examines this difficult problem and recommends policies for dealing with it, including the use of public-private collaboration.

Public-Private Initiatives

Formal collaboration between public and private sector organizations is a good way to accomplish many things that neither sector working alone could do. This is especially true with regard to establishing strong links between regional economic development and occupational education planning. Chapter 4 examines the history of this phenomena and cites a number of exemplary cases. Three modal bases for collaboration emerge from this review: 1. Public hiring private, where public institutions contract with private-sector organizations to perform a service (e.g., instruction in how to use a brand new technology); 2. Public/private entrepreneurial, where public and private sectors collaborate in creating new initiatives (e.g., a regional economic development corporation); and 3. Corporate giving, where private corporations provide resources for needed activities not otherwise feasible for public institutions to

undertake (e.g., providing expensive training or testing equipment to community colleges).

Technological Life Cycles and Occupational Education

A useful model for visualizing how to link occupational education planning with regional economic development is shown in Exhibit 1.7. Based on the well-known "product life cycle" concept, this model illustrates how a new technology, or technological product evolves and then declines through four distinct stages (introduction, growth, maturity, and stability or decline); and how a similar development governs skill training for the new technology.

By way of illustration, think about how your institution first reacted to the idea of using word processors as a possible replacement for routine typing via typewriters; and to the question of training, both for your own secretaries, and for your students. Some institutions are only now beginning to provide a broad range of student training for skill development in the use of word processing, spreadsheets and data base management applications, even though their own employees have been using them for a long time. This is an illustration of an already "mature" new technology that is an important target for occupational training.

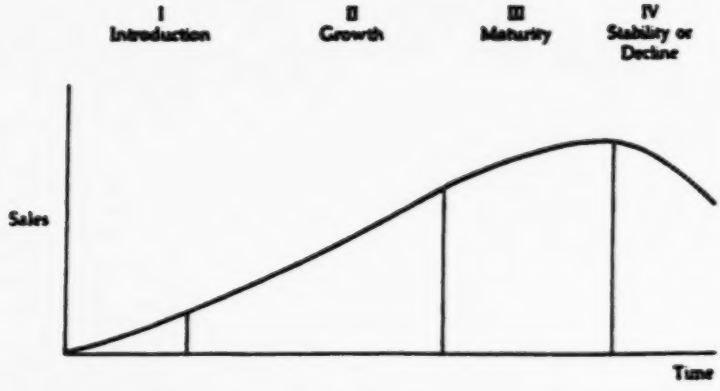
A parallel, but newly emerging, technology is that of networked business systems--a whole new generation of applications software that integrates word processing, spreadsheets and data base management, graphics, and "desk top publishing" capabilities by means of an over-arching operating system that allows many different personal computers to "talk to each other" and with it.

Use of the life-cycle model should make it easier for PSI deans and directors, as well as other community leaders to envision and discuss alternative delivery systems by which various types of "high-tech" occupational education training might best be introduced in their respective regions at the

EXHIBIT 1.7

THE TECHNOLOGICAL LIFE-CYCLE CONCEPT AS APPLIED TO SKILL TRAINING

The Product Life Cycle



Characteristic	Phase			
	I	II	III	IV
Product	Variable; often custom designs	Increasing standardization		Mostly undifferentiated; standardized
Product innovation	Frequent experimentation; major changes	Declining rate		Minor refinements, if any
Volume	Small-scale	Rising volume	Large scale	Large scale
Process	Job-shop, batch production	Increasingly automated	Capital-intensive mass production	Capital-intensive mass production
Process innovation	Exploratory	Relatively high rate; major innovations	Rate declines	Minor refinements, if any
Equipment	General purpose	Increasingly specialized		Special purpose

The Skill-Training Life Cycle

	Phase			
	I Introduction	II Growth	III Maturity	IV Stability or Decline
Tasks	Complex	Increasingly routinized		Segmented
Job skills	Firm-specific	Increasingly general		General
Skill training provider	Employer or equipment manufacturer	Market-sensitive schools and colleges	Schools and colleges more generally	Schools and colleges; some skills provided by employers
Impact on job structures	Job enlargement; new positions	Emergence of new occupations		Rigid job hierarchy with formal education and occupational work experience requirements

Source: Flynn, P. Facilitating Technological Change: The Human Resource Challenge. Cambridge, MA: Ballinger, pp. 12 & 19, 1988.

appropriate time. And it can also be used as the basis for public-private initiatives designed to reduce job displacement, especially for at-risk populations.

As you can see on Exhibit 1.7, in the early stages ("Introduction" and "Growth"), skill training is typically provided by the vender or on-the-job. Only later on (in the "Maturity" or "Stability/Decline" stages) do public-sector institutions typically provide skill training for a wide variety of students--even as a new technology is starting to enter "leading edge" business/industry sites. Good questions to ask are: "Where should our organization position itself regarding these stages?" "Who else should we collaborate with in making such choices, and in implementing them?"

Planning Methods and Guidelines

An approach designed for just such situations is summarized on Exhibit 1.8. Called "Advanced Back of the Envelope Planning," it is one of three approaches to planning introduced in Chapter 5, each requiring different levels of detail and complexity. The other two are termed Entry Level Strategic Planning and More Advanced Techniques for Strategic Planning and Management. A framework that may help you decide which method is best for you is shown on Exhibit 1.9. Chapter 5 also includes an annotated set of guidelines for utilizing emerging instructional technologies, which concludes with the checklist shown here as Exhibit 1.10. These materials were expressly designed to meet the needs of community college and technical institute deans and directors, as revealed in the needs assessment survey described in Chapter 7.

EXHIBIT 1.8

A CHECKLIST FOR "ADVANCED BACK OF THE ENVELOPE PLANNING"

1. **Vision**. What are my (my group's) predominant ⟨ . hopes / . fears / . expectations ⟩ regarding the future of "X"?

2. **Direction**. What do I (we) particularly want to ⟨ . protect / . maintain / . achieve / . change / . create ⟩ in the ⟨ . short / . medium / . long ⟩ range?

3. **SWOT**. What are the main ⟨ . strengths / . weaknesses / . opportunities / . threats / . other factors ⟩ that need to be considered? In particular, what obstacles would prevent success if not overcome or otherwise addressed?

4. **Networking and Huddling**. How, and with whom, do I want to plan for action? What are their considerations about "X?"

5. **Technology**. What methods, tools, or strategies look promising? How rigorously might we want to use each?

6. **Commitment**. How much time and effort am I (and others I can count on) willing to dedicate to this, and for how long? What other resources are likely to be available if needed?

7. **Payoff**. Assuming that adequate time and effort is expended to implement the plans, within likely resource constraints what outcomes can realistically be expected, and when?

8. **Go/No Go.** Given whatever answers you have to the above questions, is the venture really worth doing? If so, who should do what? When? What are the first steps? If not, is there anything else that makes sense to do?

EXHIBIT 1.9

A FRAMEWORK FOR CHOOSING A PLANNING METHOD

Type of District	Short Range (1 - 2 years)	Medium Range (2 - 5 years)	Long Range (5 - 10 years)
Small and resource-limited, but with high awareness and commitment	Planning Method 1	Planning Method 1, informed by Method 2	Planning Method 2 or 3
Medium-to-large, resource-wealthy, plus high awareness and commitment	Planning Method 2	Planning Method 2 or 3	Planning Method 3
Large or small, regardless of resources, with low-to-medium awareness and commitment	Planning Method 1	Planning Method 1	Planning Method 1

Note: The three planning methods, which are described in the text, are:

Method 1: "Advanced Back of the Envelope Planning"

Method 2: "Entry Level Strategic Planning"

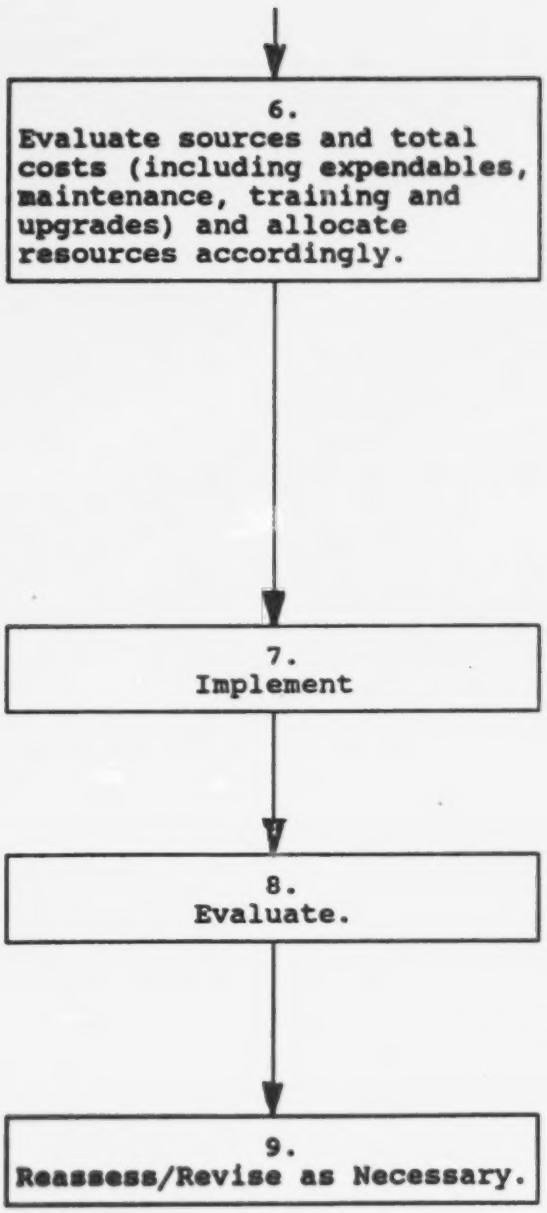
Method 3: "More Advanced Techniques for Strategic Planning and Management"

EXHIBIT 1.10

MAJOR PHASES IN INSTRUCTIONAL "TECH" UTILIZATION: A CHECKLIST

Major Phases in Instructional "Tech" Utilization	Checklist
1. Conduct needs assessment and select objectives for instruction.	For Phases 1-5
2. Set up team to identify and evaluate potential applicable technologies and techniques ("techs") for instructional delivery.	____ Include both representative cross-section of typical users and skeptics in team.
3. Determine which "techs" best meet selected needs.	____ Assess carefully being a pioneer: (price-premium, reliability, utility, leadership issues).
4. Select software with appropriate capabilities.	____ Choose general-purpose products that will never be obsolete
5. Evaluate hardware alternatives for identified software (not hardware first and software second.	____ Beware of "vaporware." ____ Be careful in buying "compatible" products (software problems, upgrades, long-term repairability).

EXHIBIT 1.10 CONCLUDED



For Phase 6

___ Think carefully before undertaking major software development projects (delays, cost, reliability, maintainability).

___ Weigh whether to buy locally or mail-order.

___ Don't put all your eggs in one basket (product, vendor).

___ In-house maintenance is cheaper.

For Phase 7-9

___ Think big when innovating (critical mass of users; multiple, alternative implementation strategies)

___ Promote flexibility in institutional plans, policies, practices, and culture (reward system altered to encourage innovation; freedom to fail).

___ Prepare for a new special interest group that "never has enough."

___ Take an appropriate (non-minimal) level of risks.

Autobiographical Reflections on The Conduct of This Research

Because the conduct of this research in so many ways paralleled the findings and recommendations we are presenting to you, our advisory committee encouraged us to end this overview chapter by reflecting on our own use of the methods of approach we recommend, on the technologies we employed, and on how they worked in practice. Three topics stand out as particularly rich learning experiences for us that you may find interesting as well:

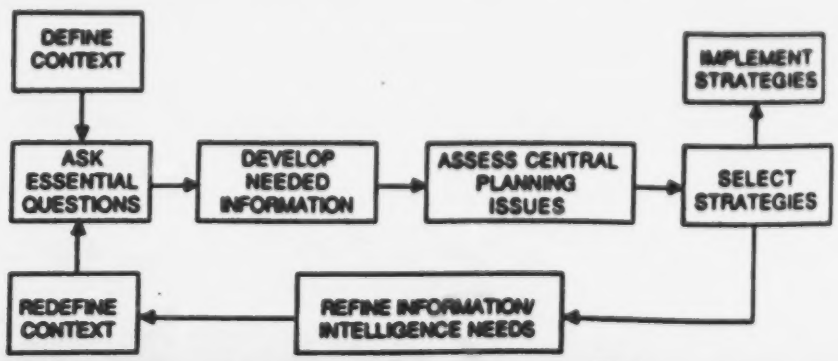
1) The Strategic Intelligence Cycle methodology we used, and ways it is and is not useful, as compared to the planning-oriented methods we recommended;

2) The differences between doing a needs assessment and actually incorporating its results in what you do; and

3) Failure to follow our own advice about "vaporware" and "equipment compatibility" in the production of this report.

The Strategic Intelligence Cycle as a Methodological Model

As stated earlier, the overall methodology we used to guide this research is a model called the Strategic Intelligence Cycle (SIC). It has this name: a) because its purpose is to focus on essential intelligence information needed to successfully implement a particular decision, action or policy, and how to find this information quickly, even though it does not exist in published sources; and b) because you must "learn to learn" about what it is you need to know--hence it works as a cycle . (The overview of the model is once again inset in the text for your convenience; see Chapter 6 for more.)



What we learned from using a pilot version of this approach in our first research on this topic (Back, et al., 1987), and from using the developed version that will soon be published in book form (described in Chapter 6), is mainly this: like many "real world" arts, it is easier to demonstrate in action than to describe in words. Several weeks were, in fact, spent trying to write a chapter which told how we used this methodology, and how it might prove useful as a way to undergird economic development and occupational planning activities. But, as it turned out, it was more appropriate to simply structure this overview chapter more or less according to the seven questions that it asks be addressed when getting underway, and to let you see for yourself how the various exhibits in Chapter 6 fit in to this methodology, and how they may be combined with the approaches we introduce in Chapter 5.

On Following a Needs Assessment in Spirit and in Deed

A second key feature of the SIC is that it directs you to focus on: 1) who the target audience is for the intelligence information you intend to get; 2) what they want to use it for: and 3) what resources and constraints you need to figure on constraining or "bounding" the effort. In the working paper cited above, our primary target audience was the professional staff of the Coordinating Board, and the essential question was: "What had to be done to make key future-oriented elements of the Master Plan feasible to implement?" Although we were clear from the outset, in the research reported here, that deans and directors of community colleges and technical institutes composed our primary target audience, we initially didn't come even close to recognizing what a profound shift that required us to make in our style of conducting and communicating the research. Fortunately, our advisory committee did recognize this, and as noted in the acknowledgments appended immediately below, they set us straight on the matter--after which we immediately did a "mid-project" needs assessment that we should have proposed in the

first place. (But once again, we came to appreciate the cyclical, learning to learn, aspect of the SIC.)

On Following Our Own Advice About "Vaporware" and Equipment Compatibility

Among his "bakers dozen" heuristics on how to stay out of trouble when planning to utilize emerging types of instructional technology, Chris Dede, in Chapter 5, warns users to avoid vaporware, and to ensure that all equipment (both hardware and software) should, to the extent feasible, be compatible. When it first came into use, "vaporware" was a term that referred to only envisioned (and often advertised) but not yet available software--but it is used in connection with hardware and software/hardware systems as well. The essence of Dede's advice is: "Don't believe it until you have seen it work for yourself."

As many of you know, the IBM PC family, and the Apple MacIntosh family of hardware and software are not mutually compatible. So, naturally, various vendors have come up with innovations to bridge the gap. Since Dede does all of his professional writing on a Mac SE in Microsoft Word and the rest of the team do theirs with IBM compatibles using WordPerfect, a way had to be found to integrate our respective contributions in this report, and several of the currently advertised bridges were considered. Without going into detail about the bridges that "didn't," know that the advice about "vaporware" is sound. When getting down to the production deadline, trust only that which you have already seen work.

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Strategic Economic Development Commission, untitled/undated packet of information sheets describing the membership, mission, mandates, overview of strategic economic development planning process, vision statement, description of the task force process, charge to task forces, et cetera. Available from the Department of Research and Planning, Texas Department of Commerce, Austin, Texas.

NOTE: For information about the business/economic development items noted above, call either Bob Farley, Department of Research and Planning, Texas Department of Commerce in Austin (512-320-9657) or Mike Edelmann, Southwestern Bell Telephone Co. in Dallas (214-464-2121).

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APPENDIX

ACKNOWLEDGMENTS, PROJECT PERSONNEL AND INSTITUTIONAL DESCRIPTION

Like all endeavors, this research could not have been undertaken and successfully concluded without the help of many people. The Project Advisory Committee listed on the front cover made a number of insightful suggestions, such as writing the report in the active voice and including the "guidesheet packet" at the front of the report. Dr. Geoffrey Fletcher, Director of Education Technology at the Texas Educational Agency, not only served on the Advisory Committee, but was External Evaluator to the project as well, in which capacity he repeatedly made suggestions how early draft materials could be made more useful to working administrators. Joe Blanda, a graduate of the (U.T. Professor) "Trimble school of deep wordsmithing," edited the report, and Tami Leger made corrections, using both Mac/Word and IBM/WordPerfect wordprocessing systems. Last but not least, our thanks to former Coordinating Board Assistant Commissioner and North Harris County College President, Dr. Nellie Thorogood, for her continuing vision and support.

The project personnel were as follows:

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